

# JAPAN

## EDICT OF GOVERNMENT

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JIS C 9335-2-25 (2003) (English): Household and similar electrical appliances -- Safety -- Part 2-25 : Particular requirements for microwave ovens, including combination microwave ovens

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*The citizens of a nation must  
honor the laws of the land.*

Fukuzawa Yukichi

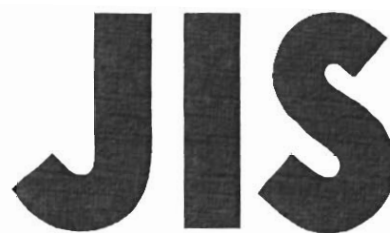
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JAPANESE  
INDUSTRIAL  
STANDARD

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Japanese Standards Association

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**JIS C 9335-2-25 : 2003**  
(JEMA)

**Household and similar electrical  
appliances—Safety—  
Part 2-25 : Particular requirements  
for microwave ovens, including  
combination microwave ovens**

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ICS 13.120; 29.020; 97.040.20

Reference number : JIS C 9335-2-25 : 2003 (E)

## Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee, as the result of proposal for revision of Japanese Industrial Standard submitted by The Japan Electrical Manufacturers' Association (JEMA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14. Consequently **JIS C 9335-2-25 : 1999** is replaced with this Standard.

This revision has been made based on **IEC 60335-2-25 : 2002** *Household and similar electrical appliances—Safety—Part 2-25 : Particular requirements for microwave ovens, including combination microwave ovens* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

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the original JIS is to be the final authority.

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## Household and similar electrical appliances—Safety—Part 2-25 : Particular requirements for microwave ovens, including combination microwave ovens

**Introduction** This Japanese Industrial Standard has been prepared based on IEC 60335-2-25 *Household and similar electrical appliances—Safety—Part 2-25 : Particular requirements for microwave ovens, including combination microwave ovens* published in 2002 as the fifth edition with some modifications of the technical contents and to be read together with JIS C 9335-1 : 2003 *Household and similar electrical appliances—Safety—Part 1 : General requirements*.

Portions underlined with dots are the matters in which the contents of the original International Standard have been modified. The list of modifications with the explanations is given in Annex 1 (informative).

**1 Scope** This Standard deals with the safety of microwave ovens for household use, their rated voltage being not more than 250 V.

This Standard also deals with combination microwave ovens, for which Annex AA is applicable.

As far as is practicable, this Standard deals with the common hazards presented by appliances that are encountered by all persons in and around the home. However, in general it does not take into account

- the use of appliances by young children or infirm persons without supervision;
- playing with the appliance by young children.

**NOTES 101** Attention is drawn to the fact that

- for appliances intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary;
- in many countries, additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the water work authorities and similar authorities.

**102** This Standard does not apply to

- commercial microwave ovens (JIS C 9335-2-90)
- industrial microwave heating equipment (IEC 60519-6)
- appliances for medical purposes (IEC 60601)
- appliances intended to be used in locations where special conditions prevail, such as the presence of a corrosive or explosive atmosphere (dust, vapour or gas).

**NOTE :** The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to **ISO/IEC Guide 21**.

IEC 60335-2-25 : 2002 *Household and similar electrical appliances—Safety—Part 2-25 : Particular requirements for microwave ovens, including combination microwave ovens* (MOD)

**2 Normative references** The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 9335-2-6 *Safety of household and similar electrical appliances—Part 2 : Particular requirements for stationary cooking ranges, hobs, ovens and similar appliances*

NOTE : **IEC 60335-2-6** : 1997 *Safety of household and similar electrical appliances—Part 2 : Particular requirements for stationary cooking ranges, hobs, ovens and similar appliances* is equivalent to the said standard.

JIS C 9335-2-9 *Safety of household and similar electrical appliances—Part 2 : Particular requirements for toasters, grills, roasters and similar appliances*

NOTE : **IEC 60335-2-9** : 1993 *Household and similar electrical appliances—Safety—Part 2-9 : Particular requirements for toasters, grills, roasters and similar appliances* and Amendment 1 (1998) are equivalent to the said standard.

**3 Definitions** Clause 3 of **JIS C 9335-1** is applicable except as follows. The terms in 3.1.7 and 3.1.9 are redefined in this Standard.

**3.1.7** 3.1.7 of **JIS C 9335-1** is applicable except as follows.

NOTE 101 The rated frequency is the input frequency.

### **3.1.9 normal operation**

3.1.9 of **JIS C 9335-1** is replaced with the following;

operation of the appliance with  $1\,000\text{ g} \pm 50\text{ g}$  of potable water at an initial temperature of  $20\text{ }^{\circ}\text{C} \pm 2\text{ }^{\circ}\text{C}$  in a cylindrical borosilicate glass vessel having a maximum thickness of 3 mm and an outside diameter of approximately 190 mm. The vessel is placed on the centre of the shelf.

### **3.101 microwave oven**

appliance using electromagnetic energy in one or several of the ISM frequency bands between 300 MHz and 30 GHz, for heating food and beverages in a cavity

### **3.102 combination microwave oven**

microwave oven in which heat is also provided in the cavity by simultaneous or consecutive operation of resistive heating elements

NOTE : The resistive heating elements are used to provide radiant heat, convection heat or steam.

**3.103 cavity**

space enclosed by the inner walls and the door in which the load is placed

**3.104 shelf**

horizontal support in the cavity on which the load is placed

**3.105 door interlock**

device or system that prevents the operation of the magnetron, unless the oven door is closed

**3.106 monitored door interlock**

door interlock system that incorporates a supervision device

**3.107 temperature-sensing probe**

device that is inserted into the food to measure its temperature and is a part of an oven control

**4 General requirement** Clause 4 of **JIS C 9335-1** is applicable.

**5 General conditions for the tests** Clause 5 of **JIS C 9335-1** is applicable except as follows. 5.2 and 5.3 are modified in this Standard.

**5.2** 5.2 of **JIS C 9335-1** is applicable except as follows.

NOTE 101 An additional sample may be required for the test of 19.104.

NOTE 102 Six samples of the interlocks are required for the test of 24.1.4.

**5.3** 5.3 of **JIS C 9335-1** is modified as follows.

Instead of carrying out the tests in the order of clauses, the following sequence of clauses and subclauses applies: 32, 22.113, 22.108, 22.115, 7 to 17, 20, 21 (except 21.101 to 21.105), 18, 19 (except 19.104), 22 (except 22.108, 22.113 and 22.115), 23 to 31, 21.101 to 21.105 and 19.104.

**5.101** Microwave ovens are tested as motor-operated appliances.

**5.102** Class III temperature-sensing probes are only subjected to the tests of 22.112.

**6 Classification** Clause 6 of **JIS C 9335-1** is applicable except as follows. 6.1 is respecified in this Standard.

**6.1** 6.1 of **JIS C 9335-1** is applicable except as follows.

Microwave ovens shall be class 0I, class I or class II.

**7 Marking and instructions** Clause 7 of **JIS C 9335-1** is applicable except as follows. 7.1, 7.12 and 7.14 are respecified in this Standard.

**7.1** 7.1 of **JIS C 9335-1** is applicable except as follows.

Appliances shall be marked with the nominal frequency in megahertz of the ISM band in which they operate.

If the removal of any cover results in microwave leakage exceeding the value specified in clause **32**, the cover shall be marked with the substance of the following:

**WARNING  
MICROWAVE ENERGY  
DO NOT REMOVE THIS COVER**

If an appliance incorporates a socket-outlet protected by means of fuses, other than D-type fuses, it shall be marked with the rated current of the relevant fuse. When a miniature fuse-link is provided, this marking shall indicate that the fuse-link is to have a high breaking capacity.

**7.12** 7.12 of **JIS C 9335-1** is applicable except as follows.

The instructions shall state the substance of the following:

**IMPORTANT SAFETY INSTRUCTIONS  
READ CAREFULLY AND KEEP FOR FUTURE REFERENCE**

The instructions for use shall include the substance of the following:

- **WARNING:** If the door or door seals are damaged, the oven must not be operated until it has been repaired by a competent person;
- **WARNING:** It is hazardous for anyone other than a competent person to carry out any service or repair operation that involves the removal of a cover which gives protection against exposure to microwave energy;
- **WARNING:** Liquids and other foods must not be heated in sealed containers since they are liable to explode;
- **WARNING:** Only allow children to use the oven without supervision when adequate instructions have been given so that the child is able to use the oven in a safe way and understands the hazards of improper use;
- the minimum height of free space necessary above the top surface of the oven;
- only use utensils that are suitable for use in microwave ovens;
- when heating food in plastic or paper containers, keep an eye on the oven due to the possibility of ignition;
- if smoke is observed, switch off or unplug the appliance and keep the door closed in order to stifle any flames;
- microwave heating of beverages can result in delayed eruptive boiling, therefore care must be taken when handling the container;
- the contents of feeding bottles and baby food jars shall be stirred or shaken and the temperature checked before consumption, in order to avoid burns;
- eggs in their shell and whole hard-boiled eggs should not be heated in microwave ovens since they may explode, even after microwave heating has ended;

- details for cleaning door seals, cavities and adjacent parts;
- the oven should be cleaned regularly and any food deposits removed;
- failure to maintain the oven in a clean condition could lead to deterioration of the surface that could adversely affect the life of the appliance and possibly result in a hazardous situation;
- only use the temperature probe recommended for this oven (for appliances having a facility to use a temperature-sensing probe).

**7.14** 7.14 of JIS C 9335-1 is applicable except as follows.

The height of the lettering of the warning specified in 7.1 shall be at least 3 mm.

Compliance is checked by measurement.

**8 Protection against access to live parts** Clause 8 of JIS C 9335-1 is applicable except as follows. 8.1.1 and 8.2 are additionally specified in this Standard.

**8.1.1** 8.1.1 of JIS C 9335-1 is applicable except as follows.

Test probe 18 of JIS C 0922 is also applied, as specified for test probe B. However, it is only applied to parts that are accessible when the oven is operated in normal use.

**8.2** 8.2 of JIS C 9335-1 is applicable except as follows.

Test probe 18 of JIS C 0922 is also applied, as specified for test probe B. However, it is only applied to parts that are accessible when the oven is operated in normal use.

**9 Starting of motor-operated appliances** Clause 9 of JIS C 9335-1 is not applicable.

**10 Power input and current** Clause 10 of JIS C 9335-1 is applicable.

**11 Heating** Clause 11 of JIS C 9335-1 is applicable except as follows. 11.2, 11.7 and 11.8 are respecified in this Standard.

**11.2** 11.2 of JIS C 9335-1 is applicable except as follows.

Stationary type appliances, other than built-in appliances, are positioned in compliance with the condition as specified in JIS C 9335-2-6 and the portable type appliances are in compliance with the condition in JIS C 9335-2-9.

A ceiling is placed over the appliance at the minimum height stated in the instructions. The ceiling has a depth of 300 mm from the back wall of the test corner and a length at least 150 mm in excess of the width of the appliance.

**11.7** The specification in 11.7 of JIS C 9335-1 is replaced with the following:

Appliances are operated for three cycles, each cycle consisting of a heating period of 10 min followed by a rest period of 1 min. During the rest periods, the door is open and the load is replaced.

**11.8** 11.8 of JIS C 9335-1 is applicable except as follows.

The temperature rises of external surfaces of microwave ovens are only measured on the surfaces that are not placed against the wall and the floor of the test corner.

There are no temperature rise limits for air-outlet grilles and for surfaces up to a distance of 25 mm from them.

NOTE 101 These surfaces do not include handles.

**12** (Not specified.)

**13 Leakage current and electric strength at operating temperature** Clause 13 of JIS C 9335-1 is applicable.

**14 Transient overvoltages** Clause 14 of JIS C 9335-1 is applicable.

**15 Moisture resistance** Clause 15 of JIS C 9335-1 is applicable except as follows. 15.2 is additionally specified in this Standard.

**15.2** 15.2 of JIS C 9335-1 is applicable except as follows.

A quantity of 0.5 L of water containing approximately 1 % NaCl is poured steadily over the shelf over a period of 1 min. If the shelf can collect spilled liquid, it is filled with the saline solution and a further 0.5 L is then added over a period of 1 min.

**15.101** Temperature-sensing probes shall be constructed so that their insulation is not affected by water.

Compliance is checked by the following test.

The probe is completely immersed in water containing approximately 1 % NaCl and having a temperature of  $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ . The water is heated to the boiling point in approximately 15 min. The probe is then removed from the boiling water and immersed in water having a temperature of  $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$  for 30 min.

This procedure is carried out five times, after which the probe is removed from the water. All traces of liquid are then removed from the surface.

The probe shall then withstand the leakage current test of **16.2**.

NOTE : Detachable temperature-sensing probes are not connected to the appliance for this test. Non-detachable temperature-sensing probes are tested in the oven, the probe being immersed as much as possible.

**16 Leakage current and electric strength** Clause 16 of JIS C 9335-1 is applicable except as follows.

**16.101** The windings of the power transformer that supplies the magnetron shall have adequate insulation.

Compliance is checked by the test of **16.101.1** for switch-mode power supplies and by the test of **16.101.2** for other power transformers.

**16.101.1 Switch mode** The insulation between the primary and secondary windings of switch-mode power supply transformers is subjected for 1 min to a voltage of substantially sinusoidal waveform and having a frequency of 50 Hz or 60 Hz. The value of the voltage is 1.414 times the rated voltage plus 750 V, with a minimum of 1 250 V.

There shall be no breakdown between windings or between adjacent turns of the same winding.

**16.101.2** Twice the rated voltage is induced in the secondary winding of the transformer by applying a sinusoidal voltage having a frequency higher than rated frequency to the primary terminals.

The duration of the test is

- 60 s, for frequencies up to twice the rated frequency, or
- $120 \times \frac{\text{rated frequency}}{\text{test frequency}}$  s, with a minimum of 15 s, for higher frequencies.

NOTE: The frequency of the test voltage is higher than the rated frequency to avoid excessive excitation current.

A maximum of one-third of the test voltage is applied and is then rapidly increased without creating transients. At the end of the test, the voltage is decreased in a similar manner to approximately one-third of its full value before switching off.

There shall be no breakdown between windings or between adjacent turns of the same winding.

**17 Overload protection of transformers and associated circuits** Clause 17 of JIS C 9335-1 is applicable except as follows.

The tests are not carried out on the power transformer that supplies the magnetron and its associated circuits, these being checked during the tests of clause 19.

**18 Endurance** Clause 18 of JIS C 9335-1 is applicable except as follows.

The door system, including hinges, microwave seals and other associated parts, shall be constructed to withstand wear that may be expected in normal use.

Compliance is checked by the following test.

The door system is subjected to 10 000 cycles of operation with the appliance supplied at rated voltage and containing an appropriate microwave-absorbing load. It is then subjected to 10 000 cycles of operation without microwave generation.

The door is opened and closed as in normal use. It is opened from the closed position to an angle between 135° and 180° or the maximum possible angle, if this is less. The rate of operation is six cycles per minute.

If a dry load is used, before starting the test and after each 10 000 cycles of operation, 100 g of water is added and the appliance operated until the water has evaporated.

This sequence is repeated until the door system has been subjected to 100 000 cycles of operation.

After the test, the microwave leakage shall not exceed the limit specified in clause 32 and the door system shall still function.

NOTE 101 Controls may be rendered inoperative in order to carry out the test.

NOTE 102 Components, the deterioration of which does not impair compliance with this Standard, may be replaced in order to complete the test.

**19 Abnormal operation** Clause 19 of JIS C 9335-1 is applicable except as follows. 19.1, 19.11.2 and 19.13 are modified in this Standard.

**19.1** 19.1 of JIS C 9335-1 is modified as follows.

Instead of subjecting the appliance to the tests of 19.2 to 19.10, compliance is checked by the tests of 19.101 to 19.104, the appliance being supplied at rated voltage.

**19.11.2** 19.11.2 of JIS C 9335-1 is applied except as follows.

The cathode-to-anode circuit of the magnetron is open-circuited and short-circuited in turn. If one of these fault conditions results in an input current that increases with decreasing voltage, the test is carried out with the appliance supplied at 0.94 times rated voltage. However, if the input current increases more than proportionally with voltage, the appliance is supplied at 1.06 times rated voltage.

The filament of the magnetron is not short-circuited.

**19.13** 19.13 of JIS C 9335-1 is applicable except as follows.

The temperature of windings shall not exceed the values shown in table 8. Only appliances that allow a pre-selected start time and those operating with a keep-warm function are considered to be appliances operated until steady conditions are established.

During the tests, the microwave leakage shall not exceed 100 W/m<sup>2</sup> measured in accordance with clause 32 but with the load as specified for each subclause. The appliance shall comply with clause 32 if it can be operated after the tests.

**19.101** Appliances are operated with controls set at the most unfavourable position and without load in the cavity.

The period of operation is the maximum time allowed by the timer or until steady conditions are established, whichever is shorter.

**19.102** Appliances are operated under normal operation with the timer or other controls that operate in normal use short-circuited.

NOTE : If the appliance is provided with more than one control, these are short-circuited in turn.

**19.103** Appliances are operated under normal operation and with any single fault condition simulated that is likely to occur. The controls are adjusted to their most unfavourable setting and the appliance is operated for the maximum time allowed by the timer or 90 min, whichever is shorter.

NOTE : Examples of fault conditions are

- blocking of air openings in the same plane;
- locking the rotor of motors if the locked rotor torque is smaller than the full load torque;
- locking moving parts liable to be jammed.

**19.104** The appliance is operated with the controls adjusted to their most unfavourable setting and with a potato placed on the shelf in the position where it is most likely to ignite and propagate flames to other combustible material.

The potato has an approximately ellipsoidal shape and a mass between 125 g and 150 g. The length of the shortest principal axis is at least 40 mm. The length of the longest principal axis is not more than 140 mm and may be symmetrically reduced in order to obtain the specified mass. A steel wire, having a diameter of  $1.5 \text{ mm} \pm 0.5 \text{ mm}$  and approximately the same length as the longest axis of the potato, is inserted along this axis.

The test is terminated 15 min after the microwave generation has ceased or a fire in the cavity has extinguished.

During the test, any fire in the cavity shall be contained within the appliance.

NOTE 1 **19.13** does not apply during the test.

After the test, if the appliance is still operable, any damaged detachable shelf is replaced and **19.13** applies. If the appliance does not comply, the test is repeated on a new appliance.

NOTE 2 Non-compliance may have resulted from the cumulative effects of previous tests.

**20 Stability and mechanical hazards** Clause **20** of **JIS C 9335-1** is applicable except as follows.

**20.101** Appliances having doors with a horizontal hinge at their lower edge and on which a load is likely to be placed shall have adequate stability.

Compliance is checked by the following test.

The appliance is placed on a horizontal surface with the door open and a mass is gently placed on the geometric centre of the door.

The mass is

- 7 kg for stationary appliances;
- 3.5 kg for portable appliances.

NOTE : A sandbag may be used for the load.

The appliance shall not tilt.

**21 Mechanical strength** Clause **21** of **JIS C 9335-1** is applicable except as follows.

Compliance is also checked by the tests of **21.101** to **21.105**.

**21.101** Hinged doors are positioned approximately 30° before the fully open position. Sliding doors are positioned so that they are approximately two-thirds open. A force of 35 N is applied to the inside surface of a hinged door at a point 25 mm from its free edge or to the handle of a sliding door.

The force is applied by means of a spring balance having a spring constant of 1.05 N/mm. It is initially applied with an opposing force applied to the other side of the door or handle. The opposing force is then removed to allow the door to complete its travel to the fully open position.

The test is carried out five times.

The test is repeated on doors of stationary appliances and built-in appliances except that

- the door is initially placed midway between the fully open and closed positions;
- the applied force is 1.5 times the force required to open the door or 65 N, whichever is greater. However if the force cannot be measured or if the door is opened indirectly, the 65 N force is applied.

The test is carried out five times.

Doors are placed midway between the fully open and closed positions. A closing force of 90 N is applied to the outside surface of a hinged door at a point 25 mm from the free edge or to the handle of a sliding door, initially with the opposing force as described above.

This test is carried out 10 times.

The appliance shall then comply with clause 32.

**21.102** Side-hinged doors are placed in the fully open position. A downward force of 140 N or the maximum force that can be applied in any door position without tilting the appliance, whichever is smaller, is then applied to the free edge of the door and the door is closed. The door is fully opened again with the force still applied.

This test is carried out five times.

Bottom-hinged doors are opened. A force of 140 N or the maximum force that can be applied without tilting the appliance, whichever is smaller, is applied to the inside surface of the door at the most unfavourable position 25 mm from the free edge.

The force is applied for 15 min.

The appliance shall then comply with clause 32.

**21.103** A cube of wood having a side dimension of 20 mm is attached to an inside corner farthest from the door hinge. An attempt is made to close the door with a force of 90 N applied at the other corner farthest from the hinge in the direction perpendicular to the surface of the door.

The force is maintained for 5 s.

The cube is then removed. The door is slowly closed until microwave generation becomes possible. The door and its opening means are then manipulated in order to determine the position resulting in the highest microwave leakage.

The appliance shall then comply with clause 32.

The test is repeated with the wooden cube attached to the other corner farthest from the hinge.

NOTE : The test is not applicable to sliding doors.

**21.104** The door is closed and its outside surface subjected to three impacts, each having an energy of 3 J. These impacts are applied to the central part of the door and may be at the same point.

The impact is applied by means of a steel ball having a diameter of 50 mm and a mass of approximately 0.5 kg. The ball is suspended by a suitable cord that is held in the plane of the door. The ball is allowed to fall as a pendulum through the distance required to strike the surface with the specified impact energy.

The door is then opened and its mating surface on the oven is subjected to three similar impacts.

The inside surface of a hinged door is subjected to three impacts as before, the test being made with the door in the fully open position. The impacts are applied to the central part of the door and may be at the same point. However, if a bottom-hinged door is horizontal when in the fully open position, the impacts are applied by allowing the steel ball to fall freely through a distance such that the specified impact energy is obtained.

A bottom-hinged door is further tested by subjecting its seal to three similar impacts. The impacts are made at three different locations.

The appliance shall then comply with clause 32.

**21.105** A bottom-hinged door is opened and a hardwood dowel having a diameter of 10 mm and a length of 300 mm is placed along the bottom hinge. The dowel is positioned such that one end is flush with an outside edge of the door. A closing force of 90 N is applied to the centre of the handle in a direction perpendicular to the surface of the door. The force is maintained for 5 s.

The test is repeated with the end of the dowel flush with the other outside edge and then with the dowel positioned centrally within the door hinge.

The microwave leakage is measured under the conditions specified in clause 32, and shall not exceed 100 W/m<sup>2</sup>.

**22 Construction** Clause 22 of JIS C 9335-1 is applicable except as follows.

**22.101** Built-in appliances shall only be vented through the front, unless provisions are made for venting through a duct.

Compliance is checked by visual inspection.

**22.102** Oven vents shall be constructed so that any moisture or grease discharged through them cannot affect creepage distances and clearances between live parts and other parts of the appliance.

Compliance is checked by visual inspection.

**22.103** Appliances shall incorporate at least two door interlocks that are operated by opening the door, at least one being a monitored door interlock.

Compliance is checked by visual inspection.

NOTE : The two door interlocks may be incorporated in the system of the monitored door interlock.

**22.104** At least one door interlock shall incorporate a switch that disconnects the microwave generator or its supply main circuit.

Compliance is checked by visual inspection.

NOTE : An equally reliable method of making the disconnection may be used as an alternative.

**22.105** At least one of the door interlocks shall be concealed and not operable by manipulation. This door interlock shall operate before any accessible door interlock can be defeated.

Compliance is checked by the following test.

The door is placed in the open or closed position and an attempt is made to operate the concealed door interlock by applying test probe B of **JIS C 0922** to all openings. A straight rod, as shown in figure 101, is also applied to any openings of the door interlock mechanism.

Door interlocks that operate magnetically are also evaluated by applying a magnet to the enclosure over the door interlock switch. The magnet has a similar configuration and magnetic orientation to the magnets that operate the door interlock. It shall be capable of exerting a force of  $50\text{ N} \pm 5\text{ N}$  when applied to a mild steel armature having dimensions of  $80\text{ mm} \times 50\text{ mm} \times 8\text{ mm}$ . In addition, the magnet shall be capable of applying a force of  $5\text{ N} \pm 0.5\text{ N}$  at a distance of 10 mm from the armature.

The door is opened and, simultaneously, an attempt is made to manually defeat any accessible door interlock.

It shall not be possible to operate the concealed door interlock during the tests.

**22.106** The supervision device of the monitored door interlock shall render the appliance inoperable if its switching part fails to control the microwave generator.

Compliance is checked by the following test.

The switching part of the monitored door interlock is rendered inoperative. The appliance is supplied at rated voltage from a supply source having a short-circuit capacity of at least 1.5 kA for appliances having a rated voltage over 150 V and 1.0 kA for other appliances.

The appliance is operated with the door closed and an attempt is then made to gain access to the cavity in the normal way. It shall not be possible to open the door, unless the microwave generator ceases to function and remains inoperable. The supervision device shall not fail in the open-circuit position.

NOTE 1 The supervision device is replaced for subsequent tests if it fails in the closed-circuit position.

**NOTE 2** It may be necessary to render other door interlocks inoperative in order to perform this test.

If an internal fuse in the circuit supplying the microwave generator ruptures, the fuse is replaced and the test is carried out two more times. The internal fuse shall rupture each time.

The test is carried out three more times but with an impedance of  $(0.4 + j 0.25) \Omega$  in series with the supply source. The internal fuse shall rupture each time.

**NOTE 3** For appliances having a rated voltage under 150 V and those with a rated current over 16 A, the test with the series impedance is not carried out.

**22.107** The failure of any single electrical or mechanical component that affects the operation of a door interlock shall not cause any other door interlock, or the supervision device of the monitored door interlock to become inoperative, unless the appliance is rendered inoperable.

Compliance is checked by visual inspection and, if necessary, by simulating component failure and operating the appliance as in normal use.

**NOTE :** This requirement does not apply to components of the supervision device that comply with the test of **22.106**.

**22.108** The door interlocks incorporated to comply with **22.103** shall operate before undue microwave leakage occurs.

Compliance is checked by the following test.

All door interlocks except one are rendered inoperative. The appliance is supplied at rated voltage and operated with the load specified in clause **32**. The door opening sequence is carried out in small increments during which the microwave leakage is measured.

The appliance shall comply with clause **32**.

The test is repeated on each door interlock in turn.

**NOTE 1** Door interlocks are only tested if they are necessary for compliance with **22.103**.

**NOTE 2** It may be necessary to render the supervision device of the monitored door interlock inoperative when carrying out the test.

**22.109** There shall be no undue microwave leakage if thin material is introduced between the door and its mating surface.

Compliance is checked by closing the door on a strip of paper having a width of  $60 \text{ mm} \pm 5 \text{ mm}$  and a thickness of  $0.15 \text{ mm} \pm 0.05 \text{ mm}$ , the paper being placed between the door and its mating surface.

The appliance shall then comply with clause **32**.

The test is carried out 10 times with the paper in different locations.

**22.110** There shall be no undue microwave leakage if the door seals become contaminated by food residues.

Compliance is checked by the following test.

The door seal is coated with cooking oil. If the seal has an open choke, the trough is filled with oil.

The appliance shall then comply with clause 32.

**22.111** There shall be no undue microwave leakage when the door corners are subjected to distortion.

Compliance is checked by the following test.

The appliance is supplied at rated voltage and operated with the load specified in clause 32. The door and its opening means are manipulated until the largest door gap permitting microwave generation is obtained. A pull force is applied perpendicular to the surface of the door to each corner in turn. The force is slowly increased to 40 N.

During the test, the microwave leakage is measured under the conditions specified in clause 32 and shall not exceed 100 W/m<sup>2</sup>.

After the test, the appliance shall comply with clause 32.

**22.112** There shall be no undue microwave leakage, and the temperature-sensing probe shall not become damaged when a probe or its cord is trapped by the door.

Compliance is checked by the following test.

The probe is connected as in normal use, the sensing part or cord being allowed to rest in the most unfavourable position likely to occur. The door is closed against the sensing part or the cord with a force of 90 N applied for 5 s in the most unfavourable place. The force is then released and, if the oven can be operated, the microwave leakage is measured under the conditions specified in clause 32 and shall not exceed 100 W/m<sup>2</sup>.

After the test, the appliance shall comply with clause 32 and the temperature-sensing probe shall comply with 8.1, 15.101 and clause 29.

**22.113** There shall be no undue microwave leakage when detachable parts are removed.

Compliance is checked by the following test.

Detachable parts are removed, except shelves, unless a horizontal surface greater than 85 mm in diameter is made available when they are removed.

The appliance shall then comply with clause 32, the load being placed on the horizontal surface as close as possible to the centre of the cavity.

**NOTE :** In order to avoid detecting non-radiating standing waves, the tip of the instrument probe is not inserted into an opening resulting from the removal of a detachable part.

**22.114** A single fault such as failure of basic insulation or a loose wire bridging the insulation system shall not allow operation of the microwave generator with the door open.

Compliance is checked by visual inspection and if, necessary, by simulating relevant faults. Wires that may become loose are disconnected and allowed to fall out of position but are not otherwise manipulated. They shall not come into contact with other live parts or earthed parts if this results in all door interlocks becoming inoperative.

NOTE 1 Failure of reinforced insulation or double insulation is considered to be two faults.

NOTE 2 Wires secured by two independent fixings are not considered likely to become loose.

**22.115** There shall be no access to the cavity through the viewing screen.

Compliance is checked by visual inspection and the following test.

A straight steel rod having a diameter of 1 mm and a flat end is pressed perpendicularly against the viewing screen with a force of 2 N. The rod shall not enter the cavity.

**23 Internal wiring** Clause 23 of JIS C 9335-1 is applicable.

**24 Components** Clause 24 of JIS C 9335-1 is applicable except as follows. **24.1** is additionally specified in this Standard.

**24.1** 24.1 of JIS C 9335-1 is applicable except as follows.

NOTE 101 IEC 60989 is not applicable to power transformers that supply the magnetron.

**24.1.4** Interlocks are subjected to the following test which is carried out on six samples.

The interlocks are connected to a load that simulates the conditions occurring in the appliance when it is supplied at rated voltage. They are operated at a rate of approximately six cycles per minute. The number of cycles is:

- door interlocks 50 000;
- interlocks only operated during user maintenance 5 000.

After the test, the interlocks shall not be damaged to such an extent that their further use is impaired.

**24.101** Socket-outlets incorporated in appliances of class I shall be single-phase, incorporate an earthing contact and have a rated current not exceeding 16 A. The socket-outlets with earthing contact shall not be used for other classes. Both poles shall be protected by fuses or miniature circuit-breakers placed behind a non-detachable cover and having a rated current no exceeding

- 20 A, for appliances having a rated voltage up to 130 V;
- 10 A, for other appliances.

If the appliance is intended to be permanently connected to fixed wiring, or is fitted with a polarized plug, the neutral pole need not be protected.

Compliance is checked by visual inspection.

NOTE : The actuating member of miniature circuit-breakers may be accessible.

If earthing is not given to the household power source wiring, an earthing device alternative to the earthing pole of socket-outlet shall be provided.

**25 Supply connection and external flexible cords** Clause 25 of JIS C 9335-1 is applicable except as follows. 25.14 is additionally specified in this Standard.

**25.14** 25.14 of JIS C 9335-1 is applicable except as follows.

For temperature-sensing probes, the total number of flexings is 5 000. Probes with circular-section cords are turned through 90° after 2 500 flexings.

**26 Terminals for external conductors** Clause 26 of JIS C 9335-1 is applicable.

**27 Provision for earthing** Clause 27 of JIS C 9335-1 is applicable.

**28 Screws and connections** Clause 28 of JIS C 9335-1 is applicable.

**29 Clearances, creepage distances and solid insulation** Clause 29 of JIS C 9335-1 is applicable.

**30 Resistance to heat and fire** Clause 30 of JIS C 9335-1 is applicable except as follows. 30.2 is additionally specified in this Standard.

**30.2** 30.2 of JIS C 9335-1 is applicable except as follows.

For appliances that allow a preselected start time and those with a keep-warm function, 30.2.3 is applicable. For other appliances, 30.2.2 is applicable.

**31 Resistance to rusting** Clause 31 of JIS C 9335-1 is applicable.

**32 Radiation, toxicity and similar hazards** Clause 32 of JIS C 9335-1 is applicable except as follows.

Compliance for microwave leakage is checked by the following test.

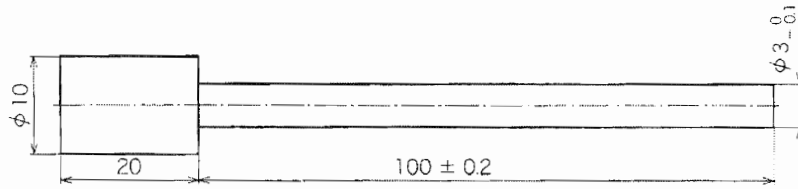
A load of  $275 \text{ g} \pm 15 \text{ g}$  of potable water having a temperature of  $20^\circ\text{C} \pm 2^\circ\text{C}$ , in a thin-wall borosilicate glass vessel having an inside diameter of approximately 85 mm, is placed on the centre of the shelf. The appliance is supplied at rated voltage and operated with the microwave power control at the highest setting.

Microwave leakage is determined by measuring the microwave flux density using an instrument that reaches 90 % of its steady reading in 2 s to 3 s when subjected to a stepped input signal. The instrument antenna is moved over the external surface of the appliance to locate the highest microwave leakage, particular attention being given to the door and its seals.

The microwave leakage at any point 50 mm or more from the external surface of the appliance shall not exceed  $50 \text{ W/m}^2$ .

NOTE 101 If compliance with the test is in doubt due to a high water temperature, the test is repeated with a fresh load.

Dimensions in millimetres



**Figure 101 Test rod for interlock concealment**

## **Annexes**

The annexes of **JIS C 9335-1** are applicable except as follows.

### **Annex A (informative)** **Routine tests**

The annex A of **JIS C 9335-1** is applicable except as follows.

#### **A.2 Electric strength test**

Modification:

The current in the test circuit may be increased up to 100 mA.

**A.101 Marking and instructions** The covers are checked to ensure that they are marked with the warnings concerning microwave energy.

The appliance is checked to ensure that the corresponding instructions are provided with it.

**A.102 Construction** The operation of the door interlock system is checked to ensure that microwave generation ceases when the door is opened.

**A.103 Microwave leakage** The microwave oven is supplied at rated voltage and operated with the microwave power control adjusted to the highest setting. The energy flux density of microwave leakage is measured at any point approximately 50 mm from the external surface of the appliance. An appropriate load may be used. The measuring instrument is moved over the external surface of the oven and the microwave leakage measured.

The microwave leakage shall not exceed 50 W/m<sup>2</sup>.

**Annex AA (normative)**  
**Particular requirement for combination microwave ovens**

The following modifications to this Standard are applicable for combination microwave ovens.

For stationary combination microwave ovens, **JIS C 9335-2-6** is also applicable. For portable combination microwave ovens, **JIS C 9335-2-9** is also applicable. However, the requirements of these standards do not take precedence over this Standard.

NOTE: If a combination microwave oven has a mode of operation independent of microwave generation, then this mode has to be tested only according to the requirements in the relevant standard. If a combination microwave oven has a mode of operations without the use of resistive heating elements, it is tested to comply with the relevant requirements of this Standard.

**AA.3 Definitions** Clause 3 of the text is applicable except **3.1.9** respecified as follows.

**AA.3.1.9 3.1.9** of the text is applicable except as follows.

The appliance is operated with the controls adjusted to the most unfavourable setting in accordance with the instructions for the intended mode of operation.

**AA.5 General conditions for the tests** Clause 5 of the text is applicable except **5.3** respecified as follows.

**AA.5.3 5.3** of the text is applicable except as follows.

NOTE 101 When testing the different modes of operation, only those tests having the most unfavourable conditions are carried out.

**AA.5.101 5.101** of the text is applicable except as follows.

Combination microwave ovens are tested as combined appliances.

**AA.7 Marking and instructions** Clause 7 of the text is applicable except **7.12** respecified as follows.

**AA.7.12 7.12** of the text is applicable except as follows.

The instructions for use shall also include the substance of the following.

Warning: When the appliance is operated in the combination mode, children should only use the oven under adult supervision due to the temperatures generated.

**AA.11 Heating** Clause 11 of the text is applicable except **11.7** and **11.8** respecified as follows.

**AA.11.7** 11.7 of the text is applicable except as follows.

Microwave ovens having a grill that can be operated simultaneously with microwave generation are operated for 30 min, the microwave power output being approximately 50 %.

Microwave ovens having convection heating that can be operated simultaneously with microwave generation are operated for 60 min, the microwave power output being approximately 50 %.

Microwave ovens having a grill or convection heating that can be operated sequentially with microwave generation are operated for 15 min with the microwave power output control adjusted to the highest setting, followed by 30 min of operation without microwave generation.

If more than half the water evaporates during the test, the vessel is refilled with boiling water, the door not being opened for more than 10 s.

NOTE 101 These tests are considered to cover appliances having programmers or timers.

**AA.11.8** 11.8 of the text is applicable except as follows.

When operating combination microwave ovens in accordance with this Annex AA, the specified temperature value in JIS C 9335-2-6 applies to stationary combination microwave ovens. Besides, the specified temperature value in JIS C 9335-2-9 applies to portable combination microwave ovens.

**AA.18 Endurance** Clause 18 of the text is applicable except the addition as follows.

Before measuring the microwave leakage, the following additional conditioning is carried out.

Resistive heating elements are operated for

- 15 min if they are used for radiant heating;
- 30 min if they are used for convection heating;
- pyrolytic self-cleaning ovens are operated for one cleaning cycle.

**AA.19 Abnormal operation** Clause 19 of the text is applicable except 19.101 modified as follows.

**AA.19.101** The test of 19.102 is carried out with the appliance supplied at 1.06 times rated voltage.

# Annex 1 (informative)

## Comparison table between JIS and corresponding International Standard

JIS C 9335-2-25 : 2003 <i>Household and similar electrical appliances—Safety—Part 2-25: Particular requirements for microwave ovens, including combination microwave ovens</i>					IEC 60335-2-25 : 2002 <i>Household and similar electrical appliances—Safety—Part 2-25: Particular requirements for microwave ovens, including combination microwave ovens</i>		
(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
1 Scope	Safety of microwave ovens for household use the rated voltage of which is not more than 250 V	IEC 60335-2-25	1	Identical with JIS.	IDT	—	
2 Normative references	Normative references in the text JIS C 9335-2-6 JIS C 9335-2-9		2	The following IEC Standards are referred to: IEC 60335-2-6 IEC 60335-2-9	MOD/alteration	As normative references, International Standards which can be replaced with JIS are all replaced.	As far as the corresponding JIS exists, the referred International Standards are replaced with JIS.
3 Definitions	Definitions of microwave oven, combination microwave oven, cavity, shelf, monitored door interlock and temperature-sensing probe		3	Identical with JIS.	IDT	—	
4 General requirement	Principle of safety		4	Identical with JIS.	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
5 General conditions for the tests	Sample size, order of testing, etc.		5	Identical with <b>JIS</b> .	IDT	—	
6 Classification	At least class 0I is required for classification of protection against electrical shock		6	At least class I is required for classification of protection against electrical shock	MOD/ addition	<b>JIS</b> recognizes the appliance of class 0I.	This addition of the appliance of class 0I is due to Japanese power supply conditions (socket-outlets without earthing).
7 Marking and instructions	Information to be marked on the cover, warning and instructions		7	Identical with <b>JIS</b> .	IDT	—	
8 Protection against access to live parts	Check carried out using test probe		8	Identical with <b>JIS</b> .	IDT	—	
9 Starting of motor-operated appliances	Unapplicable		9	Identical with <b>JIS</b> .	IDT	—	
10 Power input and current	Tolerance on indicated value and measured value of rated power input or rated current		10	Identical with <b>JIS</b> .	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
11 Heating	Setting condition, testing time and temperature measuring place are specified.		11	Equivalent to <b>JIS</b> except the following: The setting condition of microwave ovens is not divided according to the types of appliance.	MOD/ alteration	<b>11.2</b> In <b>JIS</b> , "stationary appliances other than those of built-in type are set in accordance with 11.2 of <b>JIS C 9335-2-6</b> , and portable appliances are set in accordance with 11.2 of <b>JIS C 9335-2-9</b> " in compliance with the specification for oven range, but <b>IEC</b> requires to set up under the condition of <b>JIS C 9335-1</b> .	In Japan, the portable type microwave ovens less than 18 kg are increasing recently, in addition to the stationary microwave ovens <b>IEC</b> is intending. In the standard for electric oven ranges, those of portable type do not use side wall taking the mobility into account and <b>JIS</b> applies this test method to the microwave ovens (in particular, combination microwave ovens), too, because their using method is the same. This will be proposed to <b>IEC</b> .
12 (Not specified.)	Not specified.		12	Identical with <b>JIS</b> .	IDT	—	
13 Leakage current and electric strength at operating temperature	Leakage current and electric strength test in an operating state		13	Identical with <b>JIS</b> .	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
14 Transient overvoltages	Alternative test by impulse test on a place in which the air clearance does not satisfy a specified value		14	Identical with <b>JIS</b> .	IDT	—	
15 Moisture resistance	Inundation test, moisture resistance test and insulation of temperature-sensing probes		15	Identical with <b>JIS</b> .	IDT	—	
16 Leakage current and electric strength	Assessment of insulation after moisture resistance test and insulating performance of high voltage power supply transformers		16	Identical with <b>JIS</b> .	IDT	—	
17 Overload protection of transformers and associated circuits	Temperature test simulating a state of over load or short circuit of transformers with the except of high voltage power supply transformer		17	Identical with <b>JIS</b> .	IDT	—	
18 Endurance	Door opening and closing test 100 000 times		18	Identical with <b>JIS</b> .	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
19 Abnormal operation	Short-circuit of cathode-to-anode of magnetron, operation without load, fault of control, potato ignite test and high frequency leakage test		19	Identical with <b>JIS</b> .	IDT	—	
20 Stability and mechanical hazards	Stability of appliances and protection against the approach to moving element		20	Identical with <b>JIS</b> .	IDT	—	
21 Mechanical strength	Mechanical strength of outlet hull and strength of hinge of door		21	Identical with <b>JIS</b> .	IDT	—	
22 Construction	Requirements for ventilation, requisition of two-door interlocks, protection against door clearance, and distortion of seal and corner, protection against insulation fault and prohibition of access to the cavity through the viewing screen		22	Identical with <b>JIS</b> .	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
23 Internal wiring	Reflection of internal wiring, withstand voltage, etc.		23	Identical with <b>JIS</b> .	IDT	—	
24 Components	Endurance of interlocks and restriction of the use of socket-outlets for appliances		24	Equivalent to <b>JIS</b> . However, socket-outlets for class 0I appliances are not taken into consideration.	MOD/ alteration	<b>24.101</b> The socket-outlets with 3-pole earthing are prohibited to be used for class 0I appliances.	This is because that class 0I is added in <b>6.1</b> . If the socket-outlet with 3-pole earthing is used for a class 0I appliance, class I appliance can be connected and, therefore, the conversion to lower level is prevented.
25 Supply connection and external flexible cords	Classification of power supply cords, folding test of temperature-sensing probes, etc.		25	Identical with <b>JIS</b> .	IDT	—	
26 Terminals for external conductors	Prevention of terminal screws from looseness, size of terminal screws, etc.		26	Identical with <b>JIS</b> .	IDT	—	
27 Provision for earthing	Prevention of earthing cord from looseness, corrosion resistance and ground continuity test, etc.		27	Identical with <b>JIS</b> .	IDT	—	

(I) Requirements in <b>JIS</b>		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between <b>JIS</b> and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
28 Screws and connections	Durability, classification and looseness prevention of screws, etc.		28	Identical with <b>JIS</b> .	IDT	—	
29 Clearances, creepage distances and solid insulation	Clearances, creepage distances and thickness of solid insulation		29	Identical with <b>JIS</b> .	IDT	—	
30 Resistance to heat and fire	Ball pressure test, glowing wire test, needle-flame test		30	Identical with <b>JIS</b> .	IDT	—	
31 Resistance to rusting	Preventive measures against rusting		31	Identical with <b>JIS</b> .	IDT	—	
32 Radiation, toxicity and similar hazards	Measurement of the maximum microwave leakage		32	Identical with <b>JIS</b> .	IDT	—	
Annex A	As specified in <b>JIS C 9335-1</b> .		Annex A	Identical with <b>JIS</b> .	IDT	—	



(I) Requirements in JIS		(II) International Standard number	(III) Requirements in International Standard		(IV) Classification and details of technical deviation between JIS and the International Standard by clause Location of deviation: text, annex Indication method: dotted underlines		(V) Justification for the technical deviation and future measures
Clause	Content		Clause	Content	Classification by clause	Detail of technical deviation	
Annex AA	Test method for combination microwave ovens <b>JIS C 9335-2-6</b> applies to the stationary type. <b>JIS C 9335-2-9</b> applies to the portable type.		Annex AA	Equivalent to <b>JIS</b> . However, the exception of the measurement of the outer hull when the oven function is used (when the heater is functioning) is not made clear.	MOD/ addition	<b>AA11.8</b> The microwave ovens are required that the outer hull is measured at the time of the temperature test, but <b>JIS</b> clearly specifies that the outer hull is not measured at the time when the oven function is used (when the heater is working) as in the case of electric oven range.	It is usual even in the countries where <b>IEC</b> Standards are used that the outer hull temperature is measured for the microwave oven alone but is not measured for the combination. But this application is unclear so that this Standard gives the deviation so as to unify the interpretation (proposal to <b>IEC</b> is expected).
Designated degree of correspondence between <b>JIS</b> and International Standard: MOD							

Remarks 1 Symbols in sub-columns of classification by clause in the above table indicate as follows:

- IDT: Identical in technical contents.
- MOD/addition: Adds specification item(s) or content(s) not included in International Standard.
- MOD/alteration: Alters the specification content(s) included in International Standard.

2 Symbol in column of designated degree of correspondence between **JIS** and International Standard in the above table indicates as follows:

- MOD: Modifies International Standard.

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